UNITED STATES PATENT AND TRADEMARK OFFICE

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/715,077	11/17/2003	Chandra C. Varanasi	STL11371	3298

7590 06/21/2005	EXAMINER
Seagate Technology LLC	WAMSLEY, PATRICK G
1280 Disc Drive	

ART UNIT	PAPER NUMBER
2819	

Shakopee, MN   55379

DATE MAILED: 06/21/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

	Application No.	Applicant(s)
Office Action Summary	10/715,077	VARANASI ET AL.
	Examiner	Art Unit	
	Patrick G. Wamsley	2819	

-- *The MAILING DATE of this communication appears on the cover sheet with the correspondence address* --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE <u>3</u> MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.
- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on <u>13 May 2005</u>.

2a)☐ This action is **FINAL**.   2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) <u>1-18</u> is/are pending in the application.

    4a) Of the above claim(s) <u>17 and 18</u> is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) <u>1-16</u> is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on <u>17 November 2003</u> is/are: a)☐ accepted or b)☒ objected to by the Examiner.

    Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

    Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

    a)☐ All   b)☐ Some * c)☐ None of:

      1.☐ Certified copies of the priority documents have been received.

      2.☐ Certified copies of the priority documents have been received in Application No. _____.

      3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

    * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1)☒ Notice of References Cited (PTO-892)

2)☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3)☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
    Paper No(s)/Mail Date _____.

4)☐ Interview Summary (PTO-413)
    Paper No(s)/Mail Date. _____ .

5)☐ Notice of Informal Patent Application (PTO-152)

6)☐ Other: _____ .

DETAILED ACTION

Election of Species

Applicant's election of the encoder species, readable upon claims 1-16, in the

reply filed on 05/13/2005 is acknowledged. Because applicant did not distinctly and

specifically point out the supposed errors in the restriction requirement, the election has

been treated as an election without traverse (MPEP § 818.03(a)).   Claims 17-18,

drawn to the non-elected decoder species, are hereby withdrawn from consideration.

Applicant is reminded that upon the cancellation of claims to a non-elected invention, the inventorship must
be amended in compliance with 37 CFR 1.48(b) if one or more of the currently named inventors is no longer an
inventor of at least one claim remaining in the application. Any amendment of inventorship must be accompanied by
a request under 37 CFR 1.48(b) and by the fee required under 37 CFR 1.17(i).

Specification

The disclosure is objected to because of the following informalities:

Page 5, line 13:   Change "uncoder" to -- uncoded --.

Appropriate correction is required.

The specification has not been checked to the extent necessary to determine the presence of all possible
minor errors. Applicant's cooperation is requested in correcting any errors of which applicant may become aware in
the specification.

Claim Objections

Claims 2, 10, and 15 are objected to because of the following informalities:

Claim 2, lines 4-5:   Change "a next subsequent one of the" to -- the next --.

Claim 2, line 5:   Change "data words" to -- data word --.

Claim 10, lines 5-6: Change "a next subsequent one of the" to -- the next --.

Claim 10, line 6:   Change "data words" to -- data word --.

Claim 15, line 2:   Change "adds adding" to -- adds --.

Appropriate correction is required.

Claim 6 is objected to under 37 CFR 1.75(c), as being of improper dependent form for failing to further limit the subject matter of a previous claim.

Applicant is required to cancel the claim, amend the claim to place it in proper dependent form, or rewrite the claim in independent form. The limitations found in claim 6 are substantially the same as lines 9-11 of independent claim 1.

Claim 7 is objected to under 37 CFR 1.75 as being a substantial duplicate of claim 4. When two claims in an application are duplicates or else are so close in content that they both cover the same thing, despite a slight difference in wording, it is proper after allowing one claim to object to the other as being a substantial duplicate of the allowed claim. See M.P.E.P. § 706.03(k).

Claim 14 is objected to under 37 CFR 1.75(c), as being of improper dependent form for failing to further limit the subject matter of a previous claim. Applicant is required to cancel the claim, amend the claim to place it in proper dependent form, or rewrite the claim in independent form.   The limitations found in claim 14 are substantially the same as lines 9-12 of independent claim 9.

Claim Rejections - 35 USC § 112

The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

Claims 1-16 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement.

The claims contains subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention. The examiner cannot properly evaluate the metes and bounds of the claims until the operation of the encoder is clarified, as described below.

On pages 1 and 2 of the specification, applicant describes DC-free codes and running digital sum, hereafter RDS, values, indicating that a sequence will be DC free if the RDS is bounded. The examiner has interpreted the term "bounded" to imply that the absolute value of the RDS is smaller than a predetermined threshold. Applicant emphasizes the need for a tight bound [Page 2, line 4].

On line 27 of page 5, applicant indicates that the encoder ensures that bit strings are DC-free by establishing a bounded RDS [Page 5, line 27]. Starting with an initial RDS value of zero, the current RDS will become more positive for "1" bits and more negative for "0" bits. The sign of the RDS will be positive if a sequence has had more "1" bits than "0" bits. Otherwise it will be negative, unless the number of "0" and "1" bits were perfectly equal, in which case RDS would be zero.

The first step in the encoding algorithm involves appending a binary "1" if the string's current RDS has the same sign as the RDS of the block, and appending a binary "0" if the signs differ. How does the step limit the RDS value? If the string had an excess of binary "1" values, it would have a positive sign. In this case, if the block also had surplus "1" bits, adding another binary "1" would seem to worsen the RDS problem, increasing it rather than limiting it within a tight bound.

What happens if there are the same number of "1" bits and "0" bits?   Initially, the

RDS value would be neither positive nor negative, as no bits had been entered into the

algorithm.   Apparently, this problem is handled by creating "positive zero" and

"negative zero" versions of the algorithm, as described in lines 17-20 of page 6.

However, it is unclear what happens if a string has a zero RDS value.   In that case,

would there be no need to add an extra bit, as the string is already balanced?   It's

unclear how the algorithm would function in this situation.

Applicant declares that the absolute RDS of the code word sequence is bounded

by "n+1" on lines 25-26 of Page 6.   Some of the assumptions supporting this

conclusion are troublesome.   Why must any two n-bit words differ in at least one bit,

as stated on line 11 of Page 7?   Couldn't duplicate words occur?   As applicant states

on line 18 of Page 7, repetition of the same word results in an unbounded RDS.

Also, how does applicant establish a cyclical RDS pattern?   As described in

lines 22-23 of Page 7, the RDS of the encoded sequence keeps increasing until it

reaches n in one direction (positive or negative), then crosses zero, and changes

direction.   How can this possibly occur?   Is applicant actually describing the

absolute value of the RDS instead of the positive or negative value?

The examiner needs clarification on how a "tandem" combination of an n-bit

pattern and its complement, as stated on lines 20-21 of Page 7, produces an oscillating

RDS pattern.   As best understood, the complement of a bit-pattern would substitute "0"

bits for "1" bits and "1" bits for "0" bits.   Therefore, the complement would have the

same RDS magnitude but an opposite sign.

Wouldn't the combination of RDS values having opposite values result in zero RDS? The examiner does not understand how the RDS would "keep increasing" as stated by applicant, given that the RDS contributed by the complement would be the same in magnitude but opposite in sign relative to the RDS provided by the original bit pattern. Also, if the RDS "changes direction," shouldn't it first reach a maximum, decrease to zero, decrease to a minimum, and then increase again?

The examiner has reviewed Tables 1 and 2 on Page 2, attempting to reconcile them to the encoding algorithm described on Pages 5-7. In Table 2, the third column presents accumulated RDS values, which often are "0" instead of either positive or negative. This situation produces inconsistent results.

For coding "010" to -- 0100 --, the "0" RDS value has resulted in the addition of a final "0" bit. However, a "0" bit is also appended when "111" is coded to -- 1110 --. What happened? Is a "0" RDS value treated as both positive and negative? Even worse, a "1" bit is appended for encoding "001" to -- 1101 --. The examiner is perplexed, unsure how a zero RDS value is treated, given that it doesn't fit into the "sign of the RDS" limitations currently present in the claims.

The examiner has also compared the specification to the algorithm presented in the drawings. For n-bit data words, the algorithm will work [404: Fig. 4] if n is an odd number, since the RDS value must inherently be either positive or negative. What happens if the number of bits is even, resulting in unsigned RDS values? Also, the algorithm does not explain what happens to the net RDS value for the bit stream [405: Fig. 4], which seems to have zero value treated as both +0 and -0.

Conclusion

The prior art made of record and not relied upon is considered pertinent to

applicant's disclosure.   U.S. Patent 6,867,713 to Tsang maintains a RDS value within a

selected range.   U.S. Patent 6,731,228 to Suh et al counts sign changes for each

RDS.   U.S. Patent 6,366,223 to Lee et al provides nibble and block inversion codes in

response to calculated RDS values. U.S. Patent 6,188,337 to Soljanin inverts image

data on the basis of RDS output.   U.S. Patent 5,784,409 to Coles alternates symbol

polarities in order to limit RDS values.

Any inquiry concerning this communication or earlier communications from the examiner should be directed
to Patrick G. Wamsley whose telephone number is (571) 272-1814.   The official facsimile number is (703) 872-
9306. An alternate facsimile number, (571) 273-1814, should only be used for unofficial documents.
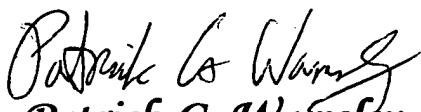
Patrick G. Wamsley

June 14, 2005